

Minima of S Cancri occur on

		h.	m.		h.	m.
Oct. 7	...	9	17.6	Dec. 3	...	6 56.3
26	...	8	30.5	12	...	18 33.0
Nov. 14	...	7	43.3	22	...	6 9.9
				31	...	17 46.3

R Leporis will be at a maximum on October 3, and  $\chi$  Cygni at a minimum on December 6 according to Schönfeld's elements, but the average period of late years, 406 days added to Schmidt's last well-determined epoch of minimum, October 11, 1878, would fix the next minimum on November 21; observations of this star are much to be desired, owing to the irregularities in the period which have been recently evident; the star is a little brighter than 13m. at minimum.

The star observed six times at Bonn in 1863 in R.A. 22h. 28m. 16.9s., Decl.  $-8^{\circ} 21' 19''$  for 1855.0 is variable from 9m. to below 13.5m., and though long notified as a variable star, appears to have been little observed. It was invisible on November 9, 1874. Cooper estimated it 9m. on October 27, 1848, and it was equally bright in August, 1855. This object is not in Schönfeld's catalogue of 1875.

THE NEW MINOR PLANETS.—Names continue to be assigned to the newer discoveries in this group, though they can hardly be said to be invariably euphonious, at least to English ears. The last circular of the *Berliner Astronomisches Jahrbuch* states that the following selection has been made by the Berlin astronomers at the request of the discoverer, Herr Palisa, of Pola: for No. 192, *Nausikaa*; No. 195, *Eurykleia*; No. 197, *Arete*; and for No. 201, *Penelope*.

THE OUTER SATELLITE OF MARS.—The satellite *Deimos* was observed by Mr. A. A. Common, of Ealing, on the morning of September 22, or three weeks earlier than Prof. Asaph Hall expected that it would be observable with the Washington 26-inch refractor. Mr. Common's angle of position, measured with his new 36-inch silver-on-glass reflector, differs only  $+1^{\circ}.8$  from that assigned by Prof. Hall's elements.

### NOTES

WE regret to have to announce the death of Mrs. Norman Lockyer, an occasional contributor to this journal and translator of several French works on popular science. Her husband's scientific work for the last eleven years owes whatever it may possess of merit to her constant interest, encouragement, and assistance. Her untimely death will be a shock to many men of science in many lands to whom she was personally known.

It will interest many of our readers to learn that Dr. William Jack, who has been an occasional contributor to NATURE, and is well known to most of those connected with it, has been unanimously elected to the chair of Mathematics in Glasgow University, recently vacated by Prof. Blackburn.

BARON FERDINAND VON MÜLLER, Government botanist of Victoria, has been rewarded for his Colonial services as a naturalist with the Knight Commandership of the Order of St. Michael and St. George.

THE death, on the 13th inst., is announced, of Mr. W. Wilson Saunders, F.R.S.

THE 110th anniversary of the birthday of Alexander von Humboldt was publicly celebrated by the Society of Cosmophiles at Leipzig on the 14th inst. A festival address was delivered by the secretary of the Society, Herr E. Haynel.

At the Berlin meeting of the German Astronomical Society on September 5-8 last the series of scientific communications

was opened by Dr. Förster, who minutely described the innovations recently made at the Berlin Observatory, which he subsequently invited the meeting to inspect. Prof. Bruhns, of Leipzig, spoke on the progress made in calculating the orbits of comets, Prof. Gylden, of Stockholm, pointing out a shorter method in these calculations. Prof. Winnecke then gave a description of the new Strassburg Observatory, and was followed by Dr. Drechsler, of Dresden, who made a communication on the collections belonging to the Royal Mathematical Saloon of Dresden. The last paper was by Prof. Schaffarick on variable stars. At the subsequent inspection of the Berlin Observatory the excellent arrangements to prevent damage to the instruments from variations in temperature were particularly admired. Great admiration was also elicited by the Astro-Physical Observatory at the Telegraphenberg, near Potsdam. The Society will meet again at Strassburg in 1881.

WE have already, in our "Notes," chronicled the "inauguration" of the Water Supply Exhibition at the Alexandra Palace by the Lord Mayor, on August 14. The exhibition is being held under the auspices of the committee for promoting a permanent water supply museum to be established somewhere in London, the lessees of the Palace kindly placing their exhibition court at the disposal of the committee for the purpose. The "inauguration" was fixed at a date when the exhibition was in a very rudimentary state; but as the Lord Mayor had given his patronage, and as he was leaving town on the 15th, it was felt undesirable to postpone it. The exhibition has grown slowly since then, though it is still far from coming up to the scheme as sketched out by the committee. The nature of the exhibition precludes its growing very rapidly, for the scheme does not appeal to many classes of exhibitors, and no commercial benefits are likely to accrue to contributors except in a few of the trade sections. It is understood that the Lord Mayor, accompanied by some of the provincial mayors, will visit the exhibition to-morrow (Friday), and will be entertained at lunch. This visit may help to draw attention to the effort to establish what might be made a very valuable institution.

THE statue to Arago was unveiled at Perpignan on September 20. Arago is represented as speaking and extending his arm towards the heavens. There are also three bas-reliefs. The first shows young Arago preparing for his examination at the Polytechnic School and studying without any master at the Old Perpignan fortifications. The second is the triumphant march from the Observatory to the Hotel de Ville, when Arago proclaimed the Republic in 1848; the great astronomer is leaning on Emanuel, his eldest son, now a member of the French Senate. The third relief represents Arago almost blind, sitting on his bed and composing his memoirs; Madame Langier, his niece, is writing what the great dying astronomer is dictating.

A METEOROLOGICAL station is to be established at Mont de Mignons, near Nice.

ONE feature of the last eruption of the remarkable volcano of Kilauca, in the Sandwich Islands, is the fact that the great molten lake of lava, occupying a huge caldron nearly a mile in width, and known as the "South Lake," was drawn off subterraneously, giving no warning of its movements and leaving no visible indication of its pathway or the place of its final deposit. "Other eruptions," writes Dr. Coan to Prof. Dana, in a letter dated June 20, "have blazed their way on the surface to the sea, or while on their subterranean way have rent the superincumbent beds, throwing out jets of steam or of sulphurous gases, with here and there small patches or broad areas of lava. But as yet no surface-marks of this kind reveal the silent, solemn course of this burning river. One theory is that it flowed deep in subterranean fissures, and finally dis-embogued far out at sea. Our ocean was much disturbed during those days, and we had what might be

called a tidal wave of moderate magnitude." The old process of replenishment which had gone on since the last eruption in 1868, is reported to have begun again, and after another decade another disorgement may take place.

THE Indian correspondent of the *Times* has recently referred to the terrible famine now prevailing in Cashmere, the immediate cause of which is no doubt the long-continued drought which has prevailed in the country. This drought unfortunately followed upon a snowfall in the winter and spring of 1877-78 in magnitude and duration unprecedented in Cashmere, or probably in any other country. Some interesting details of this extraordinary snowfall are given in a paper in the just-issued number of the *Journal of the Asiatic Society of Bengal* by Mr. Lydekker. Early in the month of October, 1877, snow commenced to fall in the valley and mountains of Cashmere, and from that time up to May, 1878, there seems to have been an almost incessant snowfall in the higher mountains and valleys; indeed, in places it frequently snowed without intermission for upwards of ten days at a time. At Dras, which has an elevation of 10,000 feet, Mr. Lydekker estimated the snowfall from the native account, as having been from 30 feet to 40 feet thick. The effects of this enormous snowfall were to be seen throughout the country. At Dras the well-built travellers' bungalow, which had stood some thirty years, was entirely crushed down by the weight of the snow which fell upon it. In almost every village of the neighbouring mountains more or less of the loghouses had likewise fallen, while at Gulmarg and Sonamarg, where no attempt was made to remove the snow, almost all the huts of the European visitors were utterly broken down by it. In the higher mountains whole hillsides have been denuded of vegetation and soil by the enormous avalanches which swept down them, leaving vast gaps in the primeval forests and choking the valleys below with the *débris* of rocks and trees. As an instance of the amount of snow which must have fallen in the higher levels, Mr. Lydekker mentions the Zogi Pass, leading from Cashmere to Dras, which has an elevation of 11,300 feet. He crossed this early in August last year, and he then found that the whole of the ravine leading up to the pass from the Cashmere side was still filled with snow, which he estimated in places to be at least 150 feet thick. In ordinary seasons this road in the Zogi Pass is clear from snow some time during the month of June. As another instance of the great snowfall, Mr. Lydekker takes the valley leading from the town of Dras up to the pass separating that place from the valley of the Kishengunga River. About the middle of August almost the whole of the first-mentioned valley, at an elevation of 12,000 feet, was completely choked with snow, which in places was at least 200 feet thick. In the same district all passes over 13,000 feet were still deep in snow at the same season of the year. Mr. Lydekker gives other instances of snow lying in places in September where no snow had ever before been observed after June. As to the destruction of animal life, in the Upper Wardwan Valley large numbers of ibex were seen imbedded in snow; in one place upwards of 60 heads were counted, and in another not less than 100. The most convincing proof, however, of the havoc caused among the wild animals by the great snowfall is the fact that scarcely any ibex were seen during last summer in those portions of the Wardwan and Tilail Valleys which are ordinarily considered as sure finds. So also the red bear and the marmot were far less numerous than usual. Mr. Lydekker estimates that the destruction to animal life caused by the snow has far exceeded any slaughter which could be inflicted by sportsmen during a period of at least five or six years.

PROF. ADLER has published a paper on the excavations at Olympia from which it appears that altogether the following numbers of antiquities have been found there:—1,328 different

sculptures, 7,464 bronzes, 696 inscriptions, 2,935 coins, 2,094 terra-cotta objects, and 105 different objects made of glass, horn, lead, &c.

BARON TAYLOR, the celebrated founder of a number of literary and scientific associations for assisting literary men, artists, and men of science, has died in Paris at the age of ninety. The aggregate income of the seven associations which he founded amounts to about 10,000*l.* The son of an Englishman, he was born in Brussels, and became a Frenchman by naturalisation. He made a number of explorations in Spain and Egypt—the Luxor obelisk being brought over mainly by his exertions. He was appointed a member of the French Senate by Napoleon III. in 1869, owing to which circumstance his funeral did not take place at the public expense, although a similar honour was paid to M. Claude Bernard, who had been his colleague in the Imperial Senate.

In a recent part of the *Zeitschrift für Biologie*, Herr Carl Nörr published the results of some experiments made by him with a view of determining the power of the human ear for distinguishing different intensities of sound. The experiments were made with leaden balls, which from a measured height were dropped on to an iron plate; thus it was possible to determine the exact intensity of the sounds by means of the distances and weights of the balls. Herr Nörr made seven different series of experiments, each with a definite intensity of sound, which varied from a just perceptible one to one 500,000 times as loud. The results showed that the percentage of correct determinations made by the ear, decreased as the difference in intensity between any two sounds compared increased. When the difference in intensities remained the same, the percentage of correct determinations was the same both for loud as well as for scarcely audible sounds. A calculation of the numbers of correct determinations found by the experiments showed that the power of distinguishing the intensities of sound follows Fechner's law most closely, *i.e.*, that the measures of sensitiveness stand in the same proportion as the reciprocal values of the square roots of difference of intensities of sounds.

WE notice among the interesting communications made at the late Anthropological Congress at Moscow, a communication, by Prof. Inostrantseff, on the discovery of very numerous remains of man of the stone period, on the shores of Lake Ladoga. All these remains are accompanied by bones of *Bos primigenius*, bear, wolf, and seal, and belong to the post-glacial epoch.

THE Russian collections of stone implements at the Moscow Archæological Exhibition were very rich, and if we take into consideration that this subject was quite neglected in Russia until the last few years, we must conclude that Russia will soon become a wide field for the exploration of this period of human civilisation. The ease with which these remains are excavated, the immense quantities in which they are found, both on the shores of the northern lakes and on the banks of southern rivers, and the very good state in which the bones are preserved (as, for instance, the skull and bones discovered by Count Ouvaroff, already mentioned in *NATURE*), will surely much contribute to the development of these studies in Russia.

In a recent paper on the radiometer to the Vienna Academy, Dr. Puluž criticises Reynold's evaporation theory and Zollner's emission theory, and holds that neither evaporation nor emission can be the sole or chief cause of radiometric movements, else there should not be a decrease in the motion when a certain degree of rarefaction has been passed. It must be supposed that the reaction-force arising from any emission of particles which takes place is extremely small in comparison with the forces arising through rebound of molecules of gaseous material already present, so that the motion is exclusively or chiefly con-



ditioned by these. With this assumption the decrease of the motion is thus explained by Dr. Puluj, according to the kinetic theory of gas: With full atmospheric pressure the reaction-force aroused on the vanes is too small to overcome the resistance of friction and the air. With sufficient rarefaction it overcomes these resistances, and the motion begins. If the reaction-force, like the internal friction, decreases but very slowly with the pressure, the velocity of motion reaches, at a certain pressure, the maximum, and on further rarefaction it decreases, because not only the resistance of the air, but also the reaction-force awakened becomes smaller with the smaller number of rebounding molecules. In an absolutely vacuous space, the motion must quite cease, if no emission of particles took place from the vanes. Dr. Puluj further describes a radiometer, consisting of a fixed cross with mica vanes blackened on one side, and a very thin cylindrical glass cover. The outer vane edges were 2 mm. distant from the glass. The glass cylinder turned, on illumination, in an opposite direction to that in which the cross should turn. The object of the experiment was to prove that the movements of the radiometer could also not be explained by air currents.

PROF. KLINKERFUES, the director of the Göttingen Observatory, has taken out a patent for a new invention in telegraphy. The professor has discovered a method by which up to eight different messages may be sent simultaneously by the same wire, an apparatus at the receiving end printing the messages separately and all at the same time. The importance of this invention to telegraphy generally needs no comment.

AT Cannstatt (near Stuttgart) a horticultural exhibition will be held from the 25th till the 29th inst.

A NEW periodical devoted to aeronautics will be published at St. Petersburg from January next, under the name of *The Aeronaut* (*Vozdukhoplavatel*). Its editor will be M. Klinger.

A SHOCK of earthquake was felt at Lyons on the 9th inst. at 7 A.M. It proceeded in a south-northerly direction and lasted two seconds.

DR. KING's annual report on the Cinchona Plantations in British Sikkim for the year ending March 31 last, together with that of the Government quinologist, Mr. C. H. Wood, are extremely satisfactory, both with regard to the cultivation and extension of the most valuable species of cinchona as well as in the preparation of the cinchona febrifuge. Of red bark trees, *Cinchona succirubra*, 353,415 were planted out, namely, 24,725 to replace old plants uprooted in taking the bark crop, and 328,690 on new land. Special attention has been paid to the most valuable of all the medicinal barks, *C. calisaya*, known as the yellow bark tree. Of this kind there were in the nursery beds at the close of the year 60,000 cuttings and seedlings in the Mungpoo division and 1,000 in the Sittong division, all of which were nearly ready at the time the report was written, for transfer to the permanent plantations. The first crop of bark of this species was obtained in the Sikkim plantation during the past season, the result showing a yield of about 1,400 lbs. of dry bark. This species we are, however, informed, is very capricious in growth, and no locality with perfectly suitable climatic conditions for it has yet been found in British Sikkim. For the purpose of ascertaining correctly the conditions under which the Dutch have succeeded in growing the tree cheaply in Java, Dr. King has received authority to proceed thither. The summary of all kinds of cinchona plants planted out during the year under review shows a total of 4,028,055, of which 3,589,965 were of the red bark species. As nearly 300,000 lbs. of bark, the produce of the previous year, remained in the quinologist's hands, it was not deemed advisable to collect a larger crop than was really necessary to meet the requirements of the febrifuge factory, con-

sequently the total crop of bark taken amounted to only 261,659 lbs. The continuous increase in the amount of febrifuge manufactured by the Government quinologist is very marked, for while in the year 1874-75 only 48 lbs. were produced, which in the following year had increased to 1,940 lbs., in the year under review no less a quantity than 7,007 lbs. were turned out, but notwithstanding this rapid development of the manufacture the increasing confidence in the efficacy of the febrifuge has raised the demand for it so much that the consumption of the past year greatly exceeded the quantity manufactured. To meet this growing demand the scale of manufacture at Mungpoo has been extended. Whether the febrifuge now so largely manufactured in India is capable of being improved by eliminating any of its constituents is a question still under the consideration of the committee appointed in 1877. It is satisfactory, however, to find that the further experience in the use of the drug during the past year has increased the confidence of the public and of the medical profession in its virtues. The question of manufacturing a superior drug which would not be exposed to the prejudices which have so long delayed the free distribution of the present febrifuge is still under the consideration of the committee before referred to. It is stated that it will probably be found advisable to manufacture at a slightly increased cost a preparation composed of the three sulphates, cinchonidine, cinchonine, and quinine in conjunction.

THE Congress of Viticulturists which took place at Coblenz on the 4th inst. will meet at Heilbronn next year, and the apicultural meeting which was held at Prague on the 7th inst. selected Cologne as a meeting place for 1880.

THE additions to the Zoological Society's Gardens during the past week include two African Sheep (*Ovis aries*) from West Africa, presented by Mr. R. B. N. Walker, C.M.Z.S.; two Ring-tailed Coatis (*Nasua rufa*) from South America, presented respectively by Mr. Chas. S. Barnes and Mr. Percy Erewis; a Common Fox (*Canis vulpes*), British, presented by Mr. Jas. Wheatley; a Caracal (*Felis caracal*), a Secretary Vulture (*Serpentarius reptilivorus*) from South Africa, presented by Dr. Holub; two Dunlins (*Tringa cinclus*), a Turnstone (*Streptopelia interpres*), a Ringed Plover (*Egialitis hiaticula*), British, presented by Mr. Edmund A. T. Elliot; two Common Cuckoos (*Cuculus canorus*), British, presented respectively by Mrs. Bolton and Miss C. Bealey; a Turquoise Parrakeet (*Euphema pulchella*) from New South Wales, presented by Mr. J. Fraser; a Square-spotted Snake (*Oxyrrhopus dolatus*) from South America, presented by Mr. H. Colgate; a Chacma Baboon (*Cynocephalus porcarinus*), a Yellow Baboon (*Cynocephalus babouin*), an Isabelline Antelope (*Cervicapra isabellina*), a Sociable Vulture (*Vultur auricularis*), two Tawny Eagles (*Aquila naevius*), two Cape-crowned Cranes (*Balearic regulorum*), a Stanley Crane (*Tetrapteryx paradisea*), from South America, deposited.

## HISTORY AND METHODS OF PALEONTOLOGICAL DISCOVERY<sup>1</sup>

### II.

WHILE the Paris Basin was yielding such important results for paleontology, its geological structure was being worked out with great care. The results appeared in a volume by Cuvier and Alex. Brongniart, chiefly the work of the latter, published in 1808.<sup>2</sup> This was the first systematic investigation of tertiary strata. Three years later, the work was issued in a more extended form. The separate formations were here carefully distinguished by their fossils, the true importance of which for this purpose being distinctly recognized. This advance was not accepted without some opposition, and it is an

<sup>1</sup> An Address, delivered before the American Association for the Advancement of Science, at Saratoga, N.Y., August 28, 1879, by Prof. O. C. Marsh, President. Continued from p. 499.

<sup>2</sup> "Essai sur la Géographie minéralogique des Environs de Paris." 4to, 1808.